

### Claims

1. Flotation separator for the separation of a dispersed liquid phase and/or solid materials from a continuous liquid phase containing free gas including; an open or a closed vessel (1) which is completely or partially filled with liquid, which vessel is  
5 equipped with at least one inlet nozzle (2) feeding the inflowing mixture fluid through at least one distribution chamber (13) toward at least one predominantly vertically arranged cyclone pipe (15) which is equipped with a swirl generating inlet device (14), a lower exit (16) which is leading the predominantly continuous liquid phase out of the cyclone pipe (15) and an upper exit (17) leading the gas, the dispersed liquid phase and/or solid  
10 materials out of the cyclone pipe(15),  
**characterized in that** the upper exit (17) is at a level that during operation the upper exit opening (17) is completely or partially submerged by the accumulated volume of liquid in the vessel.
2. Flotation separator according to claim 1,  
15 **characterized in that** the upper exit (17) is represented by an open end exit pipe (19) which is communicating with the interior volume of the cyclone pipe (15).
3. Flotation separator according to claims 1 and 2,  
**characterized in that** the upper exit (17) is represented by slits or perforations (20)  
having a vertical extension near the upper end of the exit pipe (19) which is  
20 communicating with the interior volume of the cyclone pipe (15).
4. Flotation separator according to claim 1,  
**characterized in that** the upper exit (17) is represented by an open flow passage through an annulus formed by the cyclone pipe (15) and the concentric arranged exit pipe (19).
5. Flotation separator according to claims 1, 2 and 4,  
25 **characterized in that** the upper exit (17) is represented both by an open passage through an annulus formed by the cyclone pipe (15) and the concentric exit pipe (19) and by an open ended exit pipe (19).
6. Flotation separator according to claim 1,  
**characterized in that** that part of the gas is allowed to flow into the exit pipe (19)  
30 through slits or perforations in the sidewalls of the exit pipe (19).

7. Flotation separator according to claim 1,  
**characterized in that** the accumulated volume of continuous liquid phase is separated in  
an upper section (8a) in which the at least one cyclone pipe (15) upper exit is submerged,  
and a lower section (8b) in which the at least one cyclone pipe (15) lower exit is  
5 submerged, while the upper section (8a) is only communicating with lower section (8b)  
through the at least one cyclone pipe (15).
8. Flotation separator according to claims 1 or 7,  
**characterized in that** it further comprises completely or partially enclosing plates (18)  
between the cyclone pipes (15) and the vessel's (1) inner walls.
- 10 9. Flotation separator according to claims 1, 7 or 8,  
**characterized in that** it further comprises completely or partially enclosing plates (18)  
between the at least one cyclone pipe (15) and the vessel's (1) inner walls.
10. Flotation separator according to claims 1, 7, 8, or 9,  
**characterized in that** it further comprises completely or partially enclosing plates (18)  
15 between the upper exit pipe (19) and the vessel's (1) inner walls.
11. Flotation separator according to any previous claim,  
**characterized in that** it includes a number of substantially parallel cyclone pipes (15)  
that are fed through one common distribution chamber (13) or by any number of separate  
distribution chambers (13).
- 20 12. Flotation separator according to claim 11,  
**characterized in that** the number of cyclone pipes (15) in one separator is at least 3 and  
more preferred at least 6.
13. Flotation separator according to any of the previous claims,  
**characterized in that** it comprises a designated exit (5) for the dispersed liquid phase or  
25 the solid, particulate material.
14. Flotation separator according to claim 13  
**characterized in that** the designated exit (5) is arranged downstream of a weir plate (12).